

3. the present invention to provide a digital modulation demodulator with two function of demodulation and analog-to-digital conversion . The input of intermediate-frequency signal pass through this invention demodulator will generate a digital signal including high-frequency quantized signal , then by way of low-pass filter to filter out above quantized noise signal to get the basedband signal .

Many changes and modifications in the above described embodiment of the invention can, of course, be carried out without departing from the scope thereof. Accordingly, to promote the progress in science and the useful arts, the invention is disclosed and is intended to be limited only by the scope of the appended claims.

CLAIMS

What is claimed is:

1. A new method of digital FM demodulator , comprising:
 - a. input the modulation signal to the delay lines with multiple output;
 - b. select one output signal from the multiple output delay lines;
 - c. compare the delayed signal phase with original modulation signal and accumulate each compared phase difference;
 - d. said accumulated phase difference is quantized into one or more bit digital signal;
 - e. generate another set of digital signal based on the above accumulated digital signal;
 - f. re-select output signal from the multiple output delay lines according to the signal generated in step-e;
 - g. repeat the phase comparison and accumulation in step-c , and quantization in step-d , digital accumulation in step-e and re-select output signal from the multiple output delay lines in step-f , again the step-c, d, e, f;
 - h. After one cycle of step c-d-e-f , there is one set of digital signal pass to integrator and filter out the quantized noise by way of a low-pass filter to get the original modulation signal .
2. A new method of digital FM demodulator as claimed in claim 1, wherein said phase difference could convert into voltage or current waveform for accumulation and quantization .
3. A new method of digital FM demodulator , comprising:
 - a. delay input modulation signal by digital controlled delay lines;
 - b. compare the delayed rising or falling edge of modulation signal with the original modulation signal by phase detector to generate the phase-leading or phase-lagging pulse signal;

- c. convert the phase difference of said two pulse into voltage level and stored in capacitor, the voltage difference accumulated in capacitor is equal to the phase difference accumulation;
 - d. quantize the capacitor voltage into one or more bit digital signal;
 - e. integrate or accumulate the digital signal by digital integrator to generate another set of digital signal;
 - f. put the output signal of digital integrator into the digital controlled delay lines to control the delay time of delayed modulation signal;
 - g. do a cycle of step b,c,d,e to accumulate a digital signal will generate another set of digital signal which will filter out the high frequency quantized noise by a low-pass filter to get original modulation signal.
4. A new method of digital FM demodulator, comprising:
 - a. a digital controlled delay lines used to delay input modulation signal;
 - b. a phase detector to generate phase-leading or phase-lagging signal based on the rising or falling edge of delayed modulation signal compared with original modulation signal;
 - c. a capacitor store the accumulation voltage difference, said accumulated voltage is also the accumulation of the phase difference;
 - d. a quantized one or more bit digital signal from capacitor voltage;
 - e. a digital integrator to accumulate the said above digital signal to generate another set of digital signal;
 - f. a output digital signal from said integrator to delay lines to control the delay time of delayed modulation signal;
 - g. a quantizer which output signal been filter our by a low-pass filter to get the original modulation signal.
5. A new method of digital FM demodulator as claimed in claim 4, wherein said digital controlled delay lines comprising delay units, multiplexer, and decoder; each output of delay unit is relative to each input of multiplexer and the delay time of each delay unit is the same; the input digital signal after decoding could select the corresponding output signal of multiplexer; therefore, the delay time of digital controlled delay lines is determined by input digital signal.
6. A new method of digital FM demodulator as claimed in claim 4, wherein the quantizer and digital integrator need a trigger signal that could use input modulation signal directly; said phase detector will compare the rising edge of input modulation signal and delayed modulation signal and using the falling edge to trigger said quantizer and integrator.
7. A new method of digital FM demodulator as claimed in claim 4, wherein the said quantizer could be one or more bit analog-to-digital converter and one bit quantizer is a voltage comparator.